Tungsten-Halogen vs. HPSV

Feature	Tungsten-Halogen	HPSV
Theory of Operation	Tungsten-halogen lamps contain a tungsten filament (thin wire) within a glass bulb. The filament provides resistance in an electrical circuit, which generates heat in the filament when the circuit is energized. This heat causes the filament to incandesce: to become “white-hot” and emit visible light. Halide gases are added to prevent blackening of the lamp's inner wall. During lamp operation, tungsten evaporates from the filament, chemically combines with the halide gas fill, and then redeposits onto the filament, thereby maintaining a clean bulb wall. Tungsten is used for filaments due to its high melting point (3655 K) and high strength and ductility. Only part of an incandescent lamp's radiation is visible; most is infrared and radiated as waste heat. An incandescent lamp's efficacy is directly related to its filament temperature. Maximum lighting efficacy (~53 lumens/watt) would be achieved by operating a tungsten filament at its melting point but lamp life would be very short. Thus, tungsten-halogen lamps are made to operate at lower filament temperatures, with less lighting efficacy.	Light in HPSV lamps is produced by passing electric current through sodium vapor under pressure at high temperature. The gas fill is vaporized when the gas attains operating temperature. Sodium is the primary radiating element in the arc, but mercury is added as a buffer gas for color and voltage control, and small amounts of xenon (or, sometimes, argon and neon) are used as a “starting gas”. Because long and narrow arc tube geometry is required for maximum efficiency and since starting probes are not used, extremely high voltages (~5Kv) are necessary for lamp ignition. An electronic starter circuit, working with the magnetic component of the ballast, performs the starting function. The starter supplies a high-voltage, high-frequency pulse on each cycle or half cycle of the supply voltage to ionize the starting gas and initiate the starting sequence of the lamp. Once started, the lamp warms up to full light output, during which the color output changes from a dim, bluish-white glow produced by ionized xenon to full brightness with a golden white light.
Input voltage	220 VAC	220 VAC
Power consumed	2,000 watts	1,000 watts
Light output	50,000 lumens	141,000 initial lumens; 132,000 mean lumens
Luminous efficacy	25 lumens/watt	132 lumens/watt
Correlated Color Temperature	2900K	2100K
Lamp lifetime	2,000 hours	24,000+ hours
Time to full brightness	<1 second	3 to 5 minutes to 90% of peak output; 60 seconds to 90% of peak on immediate power re-application after momentary interruption
Ballast required?	No	Yes
Dimmable?	Yes	No
Relative initial price	100%	~200%
Relative cost/lumen	100%	~76%
Relative power cost	100%	50%